

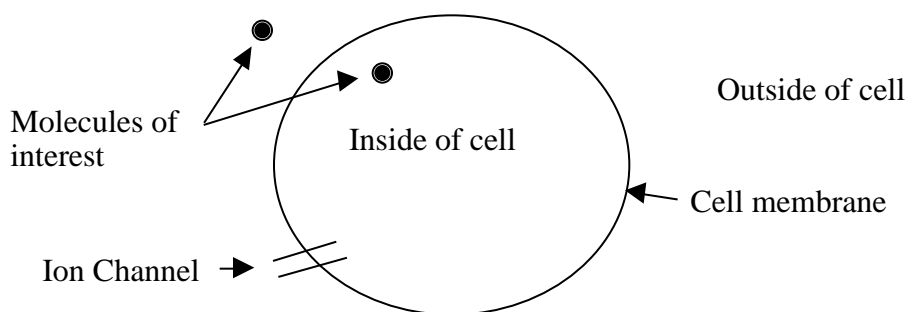


Brief Review of Membrane Structure and Osmosis

Cells and cell membranes

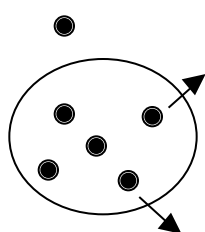
Cells are surrounded by a membrane that serves as the boundary between the cell and the surrounding environment. Exchange of nutrients, waste products, and other molecules takes place across this membrane. Membranes are semi-permeable. This means that some substances can cross the membrane freely without the help of a transporter molecule, while other substances require a specific transporter in order to cross the membrane.

This key describes the features of the diagrams below

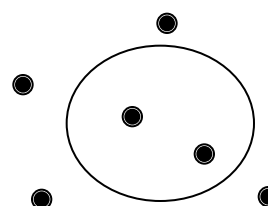


Substances that cross the cell membrane freely

O₂ or CO₂ are able to cross the cell membrane without the help of a transporter. The net movement of these molecules across the membrane will be from high concentration to low concentration until the concentration inside the cell is equal to that outside the cell.

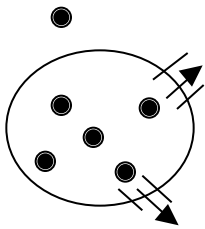


For the cell shown on the left, the concentration of O₂ (dots) inside the cell is much higher than that outside the cell. O₂ would cross the membrane (as shown by the arrows) until there is an equal concentration inside and outside the cell (right).

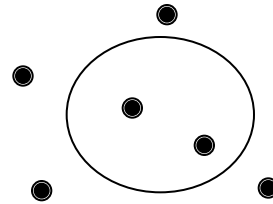


Substances that cross the membrane through specific channels

In contrast, ions such Na^+ or Cl^- are unable to cross the membrane freely. Special channels are required for these substances to cross the cell membrane. These channels are proteins imbedded in the membrane. When ions are passing through an ion channel they will move from high to low concentration. These channels can be either opened or closed, allowing the cell to control whether ions can cross the membrane. Usually ion channels are specific to a particular ion. For example, the chloride channel lets only Cl^- ions cross the membrane. Ions such as Na^+ and K^+ are unable to use the chloride channel to cross the membrane.

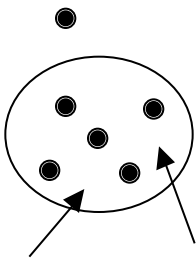


For the cell shown on the left, the concentration of Cl^- (dots) inside the cell is much higher than that outside the cell. If the Cl^- ion channels are open, Cl^- would cross the membrane through the ion channel (as shown by the arrows) until there is an equal concentration inside and outside the cell (right).



Osmosis

Water will cross the membrane by a process called osmosis. If something is unable to cross the membrane, water will cross the membrane in the direction that will help it balance the concentration inside versus outside the cell; it will move to dilute a concentrated ion.



In the cell shown on the left, the ion channels are closed, so ions (dots) have built up inside the cell. In attempt to equalize the concentration inside and outside the cell, water will move into the cell as shown by the arrows. This will cause the cell to swell in size (right).

